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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/824,855	04/04/2001	Ching-Yu Chang	4425-130	9977

7590

10/02/2003

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EXAMINER

CULBERT, ROBERTS P

ART UNIT	PAPER NUMBER
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1763

DATE MAILED: 10/02/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/824,855

Applicant(s)

CHANG, CHING-YU

Examiner

Roberts Culbert

Art Unit

1763

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 20 August 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 11-18 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 11-18 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ 6) ☐ Other: _____

DETAILED ACTION***Response to Arguments***

Applicant's arguments filed 8/20/03 have been fully considered but they are not persuasive.

1. Applicant has argued that the Erk fails to teach the function of a photoresist to protect the surface covered by froth or bubbles from being etched. (Page 7 of Remarks/Arguments) The argument is not persuasive because the examiner has not relied on Erk to teach this feature. The previous office action recites: *"Erk does not disclose the formation of a photoresist on the wafer surface. However, Official Notice is taken that the formation of a photoresist on a wafer is notoriously old and well known in the semiconductor fabrication art for the purpose of selectively processing a substrate. It would have been obvious to one of ordinary skill in the art at the time of invention to apply a photoresist to the wafer in order to selectively process the surface and form a semiconductor device in the well-known manner."*

2. Applicant has argued (Page 8 of Remarks/Arguments) that from Erk's description, it can neither be figured out nor be proved that flowing froth or bubbles would locate on the surface of the rotation wafer. The argument is not persuasive because Erk clearly describes contacting the rotating wafer with a flowing froth (See Abstract and Col. 3, Lines 20-24 for example). Since the etchant and bubbles are said to be contacting the wafer surface, it is clear that the bubbles would also be located on the surface during the period of contact.

3. Applicant has argued (Page 8-9 of Remarks/Arguments) that:

"In the present Official Action, in response to the reason for rejection of claims 11, 12, and 14-16, "the formation of a photoresist on a wafer is notoriously old semiconductor fabrication art" (see page 2 last paragraph of Office Action), Applicant does not agree with the Examiner's point of view, "the method of protecting the surface covered by froth or bubble from being etched by using froth or bubble located on the surface of substrate for playing the role of photoresist" of the present invention is never proposed previously and the feature has been clearly described lines 5-

Art Unit: 1763

22, page 6, of the original specification. Thus, this feature of the present invention is definitely not well known and is non-obvious"

The argument above is not persuasive. The examiner's Official Notice in the last office action that "the formation of a photoresist on a wafer is notoriously old and well known in the semiconductor fabrication art" is not in any way directed at "froth or bubble located on the surface of substrate for playing the role of photoresist". It is not clear if the applicant is discussing the claimed step of forming an actual photoresist, to which the Official Notice is directed, or the use of bubbles as a photoresist in the amended claims, which is an entirely different feature of the claimed invention.

4. In response to applicant's argument that the purpose of Erk is different than present invention (Page 8 of Remarks/arguments), the fact that applicant has recognized another advantage which would flow naturally from following the suggestion of the prior art cannot be the basis for patentability when the differences would otherwise be obvious. See *Ex parte Obiaya*, 227 USPQ 58, 60 (Bd. Pat. App. & Inter. 1985).

"The reason or motivation to modify the reference may often suggest what the inventor has done, but for a different purpose or to solve a different problem. It is not necessary that the prior art suggest the combination to achieve the same advantage or result discovered by applicant". See MPEP 2144.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

5. Claims 11-18 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Specifically, regarding claims 11 and 17, it is unclear how the bubbles play the role of a photoresist since they do not meet any of the characteristics of a photoresist as defined in the prior art. A photoresist, as one of ordinary skill in the art appreciates, is a thin film coated onto a substrate that is

Art Unit: 1763

exposed to radiation such as U.V. light electrons, or x-rays. The photoresist is then developed to remove either the exposed or unexposed portions. None of these features are described by applicant in reference to the claimed "bubbles". The only discernable similarity between the bubbles as described in the claimed invention and a photoresist is their use in the formation of a *mask*. For the purpose of examination, the term "mask" will replace "photoresist" in the amended portion of the claim.

It is therefore suggested that the claims be amended so that "*for playing the role of a photoresist*" is replaced with "*for playing the role of a mask*" to overcome the rejection under 35 U.S.C. 112, second paragraph.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 11, 12, and 14-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 5,340,437 to Erk in view of IBM Technical Disclosure Bulletin Vol. 30, Issue 6, Page 244.

Erk discloses a method for etching semiconductor wafers that includes the steps of immersing the wafers in an etchant solution and forming bubbles by pressurizing the solution (Fig. 1; Col. 3, Lines 20-30). The preferred etchant solution contains nitric acid and hydrofluoric acid (Col. 4, Line 1). It is clear that some bubbles are located on the surface of the wafer to be etched because the bubbles are distributed upwards toward the wafer (Col. 8, Lines 5-12). Erk does not *explicitly* teach that the bubbles play the role of a photoresist, however since it is clear that the bubbles contact the surface of the wafer they play the role of a photoresist as broadly described by applicant. The etched wafers have surface roughness from 0.06 to 0.09 micrometers (Col. 8, Lines 60-61).

Erk does not disclose the formation of a photoresist on the wafer surface. However, Official Notice is taken that the formation of a photoresist on a wafer is notoriously old and well known in the

Art Unit: 1763

semiconductor fabrication art for the purpose of selectively processing a substrate. It would have been obvious to one of ordinary skill in the art at the time of invention to apply a photoresist to the wafer in order to selectively process the surface and form a semiconductor device in the well-known manner.

Erk does not teach performing a dry process before application of a photoresist to the wafer. However, IBM Technical Disclosure Bulletin Vol. 30, Issue 6, Page 244 teaches that it is known to use a dry process before application of a photoresist to a wafer. It would have been obvious to one of ordinary skill in the art at the time of invention to use the dry process suggested in order to improve the adhesion of the photoresist and remove remaining solution from the wafer surface in the well-known manner.

7. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 5,340,437 to Erk in view of U.S. Patent 4,980,300 to Miyashita and IBM Technical Disclosure Bulletin Vol. 30, Issue 6, Page 244.

As applied above, U.S. Patent 5,340,437 to Erk in view of IBM Technical Disclosure Bulletin Vol. 30, Issue 6, Page 244 discloses the method of invention substantially as claimed, but does not show the use of a gas supply to form the bubbles in the solution.

Miyashita teaches a method for treating a wafer with bubbles that includes formation of bubbles using a gas supply tube (Col. 2, Line 65). It would have been obvious to one of ordinary skill in the art at the time of invention to use a separate gas supply in order to avoid the steps of dissolving the gas in the etchant and pressurizing the etchant solution.

8. Claims 17 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 5,340,437 to Erk in view of U.S. Patent 6,087,240 to Gilchrist.

Referring to Figure 6, Gilchrist teaches a method for forming a capacitor including the steps of providing a substrate (32), forming a first dielectric layer (36), forming a hole (38) in first dielectric layer such that part of the substrate is exposed, forming a first conductor layer (34) in the hole (38), forming a second conductor layer (40) on both the first dielectric and first conductor layers, and forming a second dielectric layer (44) and a third conductor layer (46) on the second conductor layer (40).

Art Unit: 1763

Gilchrist does not teach the step of immersing the substrate in a solution with bubbles to roughen the surface.

Gilchrist *does* teach that the conductor layers are formed from conductive polysilicon (Col. 1, Lines 44-46). Gilchrist also teaches that it is recognized in the prior art that the capacitance of a polysilicon layer may be increased by increasing the surface roughness (Col. 1, Lines 57-60).

Erk teaches a method for providing a silicon layer with a micro-roughness from 0.06 to 0.09 micrometers (Col. 8, line 60) by contacting the surface with a solution containing bubbles.

It would have been obvious to one of ordinary skill in the art at the time of invention to increase the surface roughness of the conductor layers in the capacitor by contacting the layer with a solution containing bubbles as in the method of Erk, in order to increase the surface roughness and capacitance.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

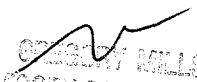
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Roberts Culbert whose telephone number is (703) 305-7965. The examiner can normally be reached on Monday-Friday (7:30-4:00).

Art Unit: 1763

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gregory Mills can be reached on (703) 308-1633. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

R. Culbert


GREGORY MILLS
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